Hydrogen in the LCFS

Public Working Meeting for Stakeholder Groups

December 5, 2016

Discussion Outline

- Introduction
- LCFS Basics [30 minutes]
  - How to: Opt-In, Register, Report, Generate and Sell Credits, Benefits of LCFS, Current Participation
- Regulated Parties for Hydrogen [30 minutes]
  - Who is eligible to generate credits for Hydrogen?
  - LCFS to monitor SB 1505
- Fuel Pathways [30 minutes]
  - Lookup Table Pathways and Qualifying Renewable Energy
- Fuel Reporting [30 minutes]
  - Facility IDs
  - Aggregators
  - EER Updates
  - H_2 Forklifts Credit Calculation
- Next Steps
  - Verification proposals – webinar #2
  - Suggested topics

How Do I Opt-In?

- To generate credits as an opt-in party you must register in the LCFS Reporting Tool and Credit Bank & Transfer System (LRT-CBTS) https://ssl.arb.ca.gov/lcfsrt/Login.aspx

- Registration Steps:
  - **Step 1:** Download/complete the "LRT-CBTS Account Registration Form"
  - **Step 2:** Upload the completed "LRT-CBTS Account Registration Form"
  - **Step 3:** Agree to LRT-CBTS General Use Conditions & Disclaimer
  - **Step 4:** Provide Organization and Administrator details

How to Register and Report Per Fueling Facility in LRT-CBTS

- Administrative Improvements Implemented for Q1 2017
  - New template to register all fueling facilities in LRT-CBTS (see below)
  - The list of fueling facilities needs to be updated quarterly (if any changes)
  - Report fuel amount dispensed per FPC and per vehicle application at each individual fueling facility, using a unique LCFS fueling facility ID that will be generated upon registration.

LRT FORM FOR FUELING FACILITY REGISTRATION

Company Name	FEIN	Fueling Facility Name	Street Address	City	Zip Code	Dispenser ID #	Fuel Type	FPCs	Application Type	Longitude	Latitude

How Do I Generate Credits?

- Submit reports indicating:
  - Amount of fuel dispensed
  - Carbon Intensity (CI) value (fuel pathway)
  - Vehicle type (e.g. light duty/medium duty, heavy duty, and forklift)
- Credits are saleable once generated, they never expire

	Compliance Timelines	
	Upload Deadlines	**Submit Deadlines**
Q1 Reporting	May 15	June 30
Q2 Reporting	August 14	September 30
Q3 Reporting	November 14	December 31
Q4 Reporting	February 14 of the following year	March 31 of the following year
Annual Reporting	April 30 of the following year	

- Staff is working with CEC to harmonize quarterly reporting using the NREL Data Collection Tool.

LCFS Credit Calculation

- The LCFS credits are determined by:
  - Amount of hydrogen dispensed (kg)
  - Carbon Intensity (CI) value (fuel pathway)
  - Vehicle type (e.g. light duty/medium duty, heavy duty, and forklift) that determines the Energy Economy Ratio (EER) used for credit calculation

- EER is the dimensionless Energy Economy Ratio relative to gasoline or diesel fuel; EER values for hydrogen are as follows:
  - LDV/MDV = 2.5
  - HDV/buses = 1.9
  - Forklifts = 2.1

How do I sell credits?

- The major refiners are the primary buyers in the LCFS
- Brokers are also available to facilitate credit transactions
- The credits can be bilaterally transferred between buyers and sellers using the LRT-CBTS

H_2 Benefits of LCFS Participation

LCFS Credit Values for Selected Representative H_2 Pathways at $100/MT LCFS Credit Price

	100% Renewable Electrolysis [A]	100% Dairy Biomethane SMR [B]	100% Biomethane SMR [B]	33% Biomethane SMR [A]	Natural Gas SMR (Gaseous H2) [A]	Natural Gas SMR (Liquified H2) [A]
CI Score (gCO2e/MJ)	0	-300	54	88	106	144
FCEV EER-adjusted CI	0	-120	22	35	42	57
Credit Value ($/kg)	**$2.90**	**$6.50**	**$2.25**	**$1.84**	**$1.62**	**$1.17**

1 kg ≈ 1.04 GGE

[A] Certified LCFS Pathway

[B] Staff Estimate

Credit value calculator: http://www.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm

Low Participation by Hydrogen Providers in the LCFS

	Unit	Q3 2015	Q4 2015	Q1 2016	Q2 2016
H_2 reported to LCFS	kg	-	2,282	1,074	1,466
All H_2 dispensed at California stations * (NREL)	kg	1,324	3,079	8,716	16,597
% reported to LCFS	%	0.0%	74.1%	12.3%	8.8%

* includes an unknown amount dispensed for testing (non-transport) purposes.

QUESTIONS:

- In spite of the benefits, we've seen low participation among hydrogen providers. Due to low throughput? Perception of administrative difficulty? Lack of cooperation along supply chain? Should ARB conduct additional outreach? Help us understand the roadblocks so we can support you in joining the LCFS and recognizing the GHG reductions this industry is achieving in California.

Potential changes related to

Eligibility

Monitoring for SB 1505

REGULATED PARTIES FOR HYDROGEN

LCFS Eligibility

- *Summary:* Considering a regulatory amendment to designate fueling facilities as first-in-line to generate credits, with option to contractually pass the right to an upstream producer or aggregator.
  - Currently the "owner of the finished fuel," or a person acquiring ownership of the fuel, may report quantities of H_2 dispensed for transportation to generate LCFS credits.
- *Rationale:* To increase participation and ensure accurate accounting of dispensed fuel. To clarify that any fuel owner in the supply chain for hydrogen may generate credits provided that no other entity is claiming credit for the same unit of fuel.

- ***QUESTIONS:***
  - Share your thoughts on the flexibility of allowing any fuel owner to register, report and generate credits. Do you have suggestions or concerns about how ARB can ensure there is no double-reporting?
  - Is the suggested amendment, establishing priority, an improvement?

LCFS to Monitor SB 1505 Targets

- *Summary:* Removing opt-in status of hydrogen fuel. Each provider will need an approved CI to report all quantities of H_2 used for transportation.
- *Rationale:* To monitor whether the statewide hydrogen pool is achieving 33% renewable and 30% CI reduction
- *Important considerations:*
  - All hydrogen dispensed for transportation will need to be reported with the appropriate fuel pathway code.
  - One entity in the supply chain (or an aggregator) must be responsible for reporting and generating credits.
  - Although participation will not be required until 2019, we encourage H_2 providers to get registered and begin generating credits now.

Lookup Table Pathways

Qualifying renewable power & RNG

FUEL PATHWAY EVALUATION

Lookup Table Pathways

- *Summary:* Lookup Table pathways are the easiest method of applying for a carbon intensity (CI) score. Lookup Table pathways have conservative CI values that can be used with minimal producer-specific operational data.
- *Rationale:* To provide flexibility for producers to quickly begin reporting and generating credits.
- *Important considerations:* The Lookup Table score may be higher than achievable if a producer submits the full set of operational data inputs required for a Method 2 application. Verification for Lookup Table pathways will focus on accuracy of reported fuel amounts and renewable energy and feedstock inputs.

- *QUESTIONS:*
  - Please review the Lookup Table pathways and provide feedback on how to make the lookup table options more applicable.

Current Lookup Table Pathways

Existing Lookup Table Pathways	CI (gCO2e/MJ)	EER-adjusted CI
Compressed H_2 from central reforming of NG (includes liquefaction and re-gasification steps)	151	60.4
Liquid H_2 from central reforming of NG	144	57.4
Compressed H_2 from central reforming of NG (no liquefaction and re-gasification steps)	106	42.3
Compressed H_2 from on-site reforming of NG	105	42.1
Compressed H_2 from on-site reforming with 33% renewable feedstocks	88	35.3

New & Revised Lookup Table Pathways

Pathways for Steam Methane Reformation	Pathways for Electrolysis
Compressed H_2 from reforming of NG (includes liquefaction and re-gasification steps)	Compressed H_2 from electrolysis with average California grid electricity (includes liquefaction and re-gasification steps)
Compressed H_2 from reforming of NG (No liquefaction and re-gasification steps)	Compressed H_2 from electrolysis with average California grid electricity (No liquefaction and re-gasification steps)
Compressed H_2 from reforming with NG process energy and 100% biomethane feedstock (includes liquefaction and re-gasification steps)	Compressed H_2 from electrolysis with 100% renewable solar/wind electricity (includes liquefaction and re-gasification steps)
Compressed H_2 from reforming with NG process energy and 100% biomethane feedstock (No liquefaction and re-gasification steps)	Compressed H_2 from electrolysis with 100% renewable solar/wind electricity (No liquefaction and re-gasification steps)

Renewable Hydrogen – Electricity (1)

- *Summary:* Add flexibility for non-co-located renewable power and clarify current rule.
  - See Hydrogen discussion paper, page 6:

(1) Green Tariff Shared Renewables (GTSR)* and (2) "off-site, co-owned" provisions

- *Rationale:* To provide flexibility for producers to meet renewable targets, while ensuring that power is traceable, additional to RPS, and not double-counted in any other program.
- *Considerations:*
  - Compliance requirements would include ARB approval and ongoing review of the metering methodology, utility or other contracts to ensure that the renewable power does not also generate any RECs or other renewable attributes in any other program.

* Green Tariff/Shared Renewables Program (GTSR): http://www.cpuc.ca.gov/General.aspx?id=12181

Renewable Hydrogen – Electricity (2)

- *Summary:* In reviewing the applications submitted to the CEC for state funding of hydrogen stations, staff has observed that many plans include the use of RECs to meet the 33% renewable hydrogen requirement of the grant applications.
  - LCFS does not count the purchase of RECs to reduce a fuel's CI score
  - The proposal does not include allowing RECs to reduce the CI associated with hydrogen production, nor counting RECs as contributing toward the SB 1505 statewide requirement of 33% renewable hydrogen.
- *Important considerations:* Percent renewable will be determined on the basis of electrolyzer energy demand, rather than total life cycle energy inputs.
- ***QUESTIONS:***
  - Staff is seeking stakeholder discussion and feedback on the potential methods for recognizing renewable electricity used in H_2 production.
  - Will the proposal meet the objective of ensuring power is traceable and not double-counted? Are there other approaches that may meet these objectives?

Renewable Hydrogen - Biomethane

- *Summary:* Staff is considering an amendment to clarify the distinction between biomethane (RNG) used as process energy and RNG used as a feedstock: Renewable attributes are recognized to reduce CI of the fuel when RNG is a feedstock, as with bio-CNG.
  - Staff suggests the use of RNG as a feedstock in SMR is distinct from RNG used for process energy; feedstock should qualify to reduce CI and count toward meeting renewable targets of SB 1505.
- *Rationale:* To provide flexibility for producers to meet renewable targets, while ensuring that power is traceable and not double-counted in any other program.
- *Considerations:* Reporting party must provide contracts and invoices documenting the terms of the sale from the biogas producer to a marketer or other purchasing entity, and from that entity to the hydrogen producer or fueling facility owner.

Potential Non-Regulatory Changes for Enhanced Reporting, and Potential Regulatory Amendments to Reporting Requirements

FUEL REPORTING

Hydrogen Fueling Facility IDs

- *Summary:* Assign unique LCFS identifier based on dispenser model/ serial # for each registered fueling facility.
- *Rationale:* Facility-specific IDs would help avoid double counting and facilitate verification.

QUESTIONS:

- Does basing unique identifiers on dispensing equipment for each hydrogen fueling facility make sense?
- What are current industry standards for identifying fueling facilities, if any?

Third-party Aggregators

- *Summary:* Allow aggregators to generate credits on behalf of initial credit generator.
- *Rationale:* To increase participation and facilitate sale of LCFS credits.
- *Important considerations:* Initial credit generator could contractually designate a third party to manage reporting and credit generation. The aggregator would become the reporting party—in addition to generating credits, aggregators accept verification responsibility.

QUESTIONS:

- Would you be likely to take advantage of this option? Will this reduce administrative burden? Improve economic benefits of LCFS? Do you foresee issues contractually working out agreements?

Update EER Values and Add New Vehicle Categories

- *Summary:*
  - Update the EERs based on newly available studies and data
  - Determine a specific hydrogen fuel cell bus EER, separating it from the current generic category of heavy duty fuel cell vehicles.
- *Rationale:*
  - Improve accuracy of credit calculation

QUESTIONS:

- Staff is seeking stakeholder feedback to update existing EER values develop hydrogen fuel cell bus EER.
- Any other vehicle categories to add?

Credit Calculation for Post-2010 Hydrogen Forklifts

- *Summary:* Current credit formula for hydrogen fuel cell forklifts does not include an EER adjustment. Staff is considering allowing post-2010 forklifts to use regular credit formula that includes the EER adjustment.

- ***QUESTION:*** Staff is seeking stakeholder discussion and feedback on revising the credit calculation formula.

Verification Program Overview

Considerations for Hydrogen

VERIFICATION

Verification Overview (1)

- *Summary:* Addition of mandatory verification of various program aspects including, but not limited to:
  - Fuel pathway carbon intensities
  - Reported fuel quantities
  - Chain-of-custody information

- *Rationale:* Needed to ensure integrity in LCFS credit market through assurance of GHG reduction claims and to improve consistency with international standards of assurance

Verification Overview (2)

- *Important Considerations—Guiding Principles:*
  1. ARB retention of sole authority over the LCFS program, including verification requirements, as bestowed through the State's legislative and regulatory process;
  2. Continual improvement in the detection, prevention, and correction of errors or fraud;
  3. Identification and implementation of cost reducing strategies, while maintaining verification rigor;
  4. Policy consistency with other ARB verification programs; and
  5. Consideration of the unique attributes of fuel carbon intensities and fuels marketing structure.

Verification Considerations for Hydrogen

- Staff is considering cost-reducing verification strategies while achieving reasonable assurance of credit validity

- Verification for accuracy assurance of
  - reported fuel amounts,
  - energy use and type, and
  - feedstock production/purchases

- Review of documents along the supply chain
  - i.e., PTDs, contracts and invoices, bills of lading

- Periodic site visits to upstream facilities and fueling stations

Verification Questions

- Staff is seeking stakeholder feedback on exempting small hydrogen fuel providers and reporting parties from third-party verification. Exempt entities would be audited by ARB.
  - Would a threshold based on annual credit generation be preferable?
  - Would an exemption for single location reporters be preferable?

- If hydrogen producers report under both MRR and LCFS, should they be required to have their LCFS data verified by third-party verifiers? Staff envision this can be accomplished by the hydrogen producer's MRR verification body with LCFS-specific ARB guidance or training.

- Staff seeks to identify other solutions that can mitigate costs while still providing data quality assurance.

Anticipated Next Webinar Topics

- Feedback and updates on topics from this webinar
- Suggestions from stakeholders?

Attend 2017 LCFS Workshops for topics affecting all fuels

THANK YOU!

Feedback should be sent to

LCFSworkshop@arb.ca.gov

by January 6th, 2017